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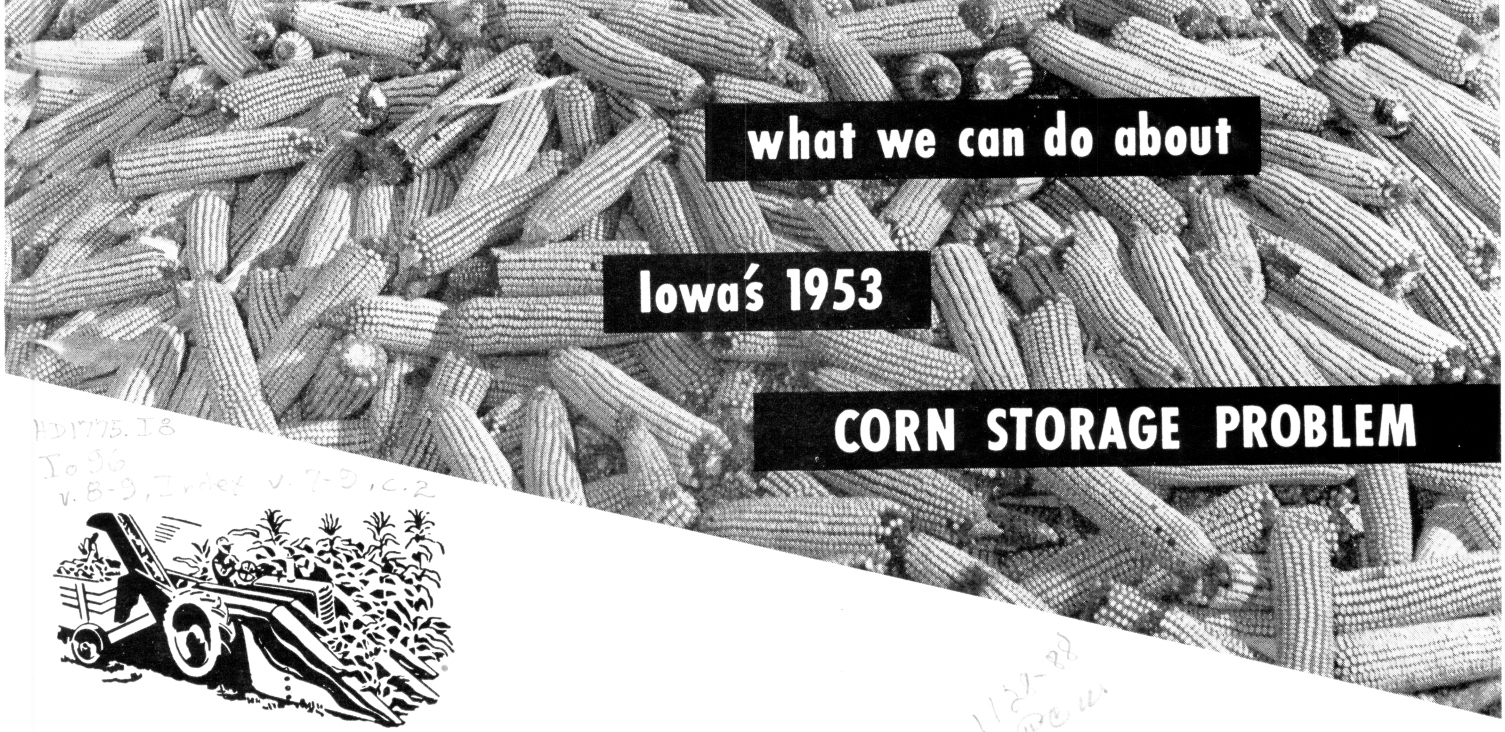
What We Can Do About Iowa's 1953 Corn Storage Problem

Iowa Farm Science Editorial Board



what we can do about Iowa's 1953 CORN STORAGE PROBLEM

IOWA FARMERS will have a lot of corn on hand this fall. So will farmers in the other Corn Belt states. All told, around 800 million bushels of old-crop corn will be carried over.

Not all of this will be in farmers' hands. Commodity Credit Corporation probably will have around 200 million bushels of corn from earlier years on hand. Around 400 million bushels—give or take a little—will be under loan or purchase agreement. The remainder will be free corn, either in farmers' or the trade's hands.

With another potentially big corn crop in the making, this creates a real problem of how to store all the corn this fall. The acreage planted to corn this year is large—in Iowa it may be the largest ever. But of course the size of the 1953 corn crop will be determined by the weather from here on out.

The problem is complicated by the large amount of 1952 crop sealed corn that farmers and landlords want to deliver to CCC. Iowa farmers, for example, have about 170 million bushels either under seal or purchase agreement. To handle this, only about 60 million bushels of empty CCC bin capacity will be available in the state this fall. Another 20 million bushels might be stored by bonded elevators. PMA estimates that around 42 million bushels will be resealed by farmers—leaving 45 to 50 million bushels with no place to go as things stand today.

The Iowa situation is complicated by the fact that the major share of this excess 1952 crop corn is located in around 30 central and northwestern counties which comprise the main cash grain producing areas of Iowa. Here is where the problem is really acute. These farmers and landlords are commercial producers of corn for sale—they do not have the same incentive to hold inventories of corn in a period of possible price decline as do farmers in heavy livestock producing areas. But the situation will be nip and tuck in many other parts of Iowa, too.

Most of the other Corn Belt states have a much less pressing problem. Minnesota expects to have about 10 million bushels of corn delivered this fall over and above the available empty bin capacity. Illinois, on the other hand, has about enough empty bin capacity to handle the 1952 corn that will be delivered. Trouble there is that the empty bins are out of the cash grain area where the need is focused. Nebraska's problem is somewhat similar to that in Illinois.

The Commodity Credit Corporation is strongly encouraging farmers to reseal their corn. A 13-cent per bushel storage fee will be paid farmers who reseal their corn and deliver it a year from now. As of this date (June 15), no storage payment will be made in case the corn is redeemed, however. And the farmer himself is responsible for maintaining grade of his resealed corn.

Thus, it's plain that Iowa farmers will carry over a good deal more old corn than they have for several years. How can we handle this corn to maintain its quality? That's the number 1 corn problem facing us right now.

New Construction . . .

To make room for additional corn storage on the farm many farmers will be building new storage space this year. Whether this investment in additional storage will yield reasonable returns may depend as much or more on sound planning of the building and on storage management as on future marketing conditions and storage programs.

There are many crib or bin designs and many construction materials that can be used. Prefabricated cribs and bins of wood, steel and many other materials are widely available. They are generally competitive in cost and have, in most cases, demonstrated

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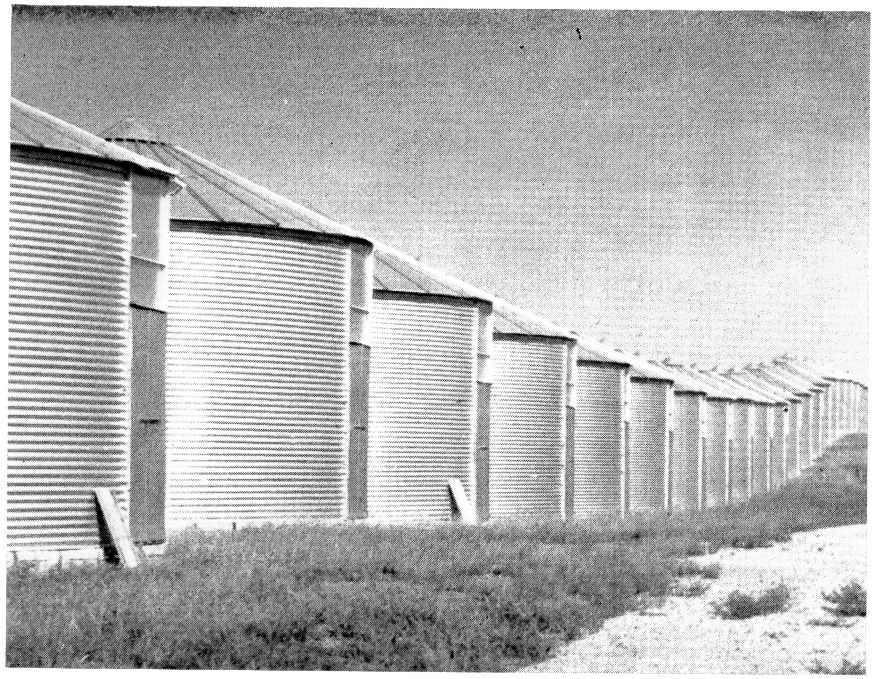
THIS ARTICLE is a special report prepared by members of the staff of the Iowa State College Agricultural Extension Service and the Iowa Agricultural Experiment Station and by specialists of the United States Department of Agriculture.



PMA estimates there will be only about 60 million bushels of empty CCC bin space. Another 20 million bushels might be stored by bonded elevators and perhaps some 40 million bushels will be resealed by farmers—leaving 45 to 50 million bushels to find somewhere else to go.

their effectiveness as sound and economical storage structures.

For storage to be constructed entirely at the site, numerous materials manufacturers and associations of manufacturers of particular materials have prepared standard crib or bin plans. The Midwest Plan Service, a cooperative enterprise of agricultural colleges in the Midwest, has available about 30 plans of grain storage structures in a wide variety of sizes, types and construction materials. See the catalog of these plans at your county extension director's office, PMA office, your lumber dealer, or write to the Extension Service at Iowa State College for your own copy. After selecting the plan which meets your requirements, order plans by number as per instructions included in the catalog.

Present indication is that construction materials of all types and classes will be more available this year than for some time past—with the possible exception that cement may be in short supply at the peak of the highway construction season.

Crib Requirements: Regardless of the design or construction material used in a corncrib, it should meet the following requirements: It should have the necessary strength to hold corn. It should provide for either natural or forced ventilation of air through all of the stored corn. It should protect corn against weather, rodents and thieves and maintain grain quality for a 2- or 3-year period. And it should provide access for inspection.

A good foundation is absolutely necessary. To prevent settling, the bottom of the foundation should have an area equivalent to at least 1 square foot for each 40 bushels of stored corn. The building frame should be rigidly attached to the foundation to prevent spreading of the base of the crib or possible wind damage when the structure is empty.

Corn which has been reduced to a fairly low moisture content may take water from the atmosphere in certain seasons—with a resulting expansion in the actual volume of stored corn. It therefore is important that extra strength be built into cribs which are to store the same corn for more than one year.

An empty crib, being large and comparatively light in weight, is easily subject to wind damage. To provide internal bracing, a series of X-braces fairly closely spaced or solid partitions at intervals of about 16 feet are necessary. If there is at least a possibility that artificial drying of corn may be done in the crib at present or some future date, heavy sidewall framing and solid partitions are preferable to an X-bracing system.

In double cribs and granaries, all weight of grain overhead must be carried on the sidewalls of the alley which will require heavier foundations and wall framing than for the outside walls of the same building.

Under normal Iowa conditions the moisture content of corn at time of harvest is too high for safe permanent storage. Unless the corn is to be used by the following spring, provision for removal of excess moisture by either natural or forced ventilation must be made. When dependent on natural ventilation, the most critical dimension of rectangular cribs is the width.

For the six counties in extreme northeast Iowa width should be not over 6 feet; the remainder of northeast Iowa should have not over 7-foot-wide cribs; 8 feet is satisfactory throughout the rest of the state. Openings should total at least 8 or 10 percent of the wall area. More opening improves the circulation of air but also admits more rain and snow.

Cribs using natural ventilation should not be sheltered from wind by other buildings, trees or high embankments and should never be constructed as a lean-to to some other building.

The above suggestions for natural air drying are not applicable to cribs equipped for forced ventilation. Important requirements here are that the design must be such that air passes through all the corn and that it passes through a uniform depth or thickness to control the rate of flow. Since corn shrinks and settles as it is being dried, the use of X-braces usually results in some corn resting on the braces and gaps or voids in the corn immediately below the braces. Air escapes through these gaps, and drying is not effective.

In cribs where air is forced laterally from one side of crib to the other or from a central driveway to the outside of double cribs, end walls must be tightly sided to prevent escape of air through corners of the crib. Secure and follow the

proper instructions for selecting and installing necessary fan equipment and also the burner equipment if heated air drying is to be used.

With increasing emphasis on clean grain, provision for ratproofing with hardware cloth and sheet metal as described later in this article should be made.

Grain Bins: Grain bins should meet the following requirements: They should have strength to hold the stored corn. Large bins for shelled corn should have provision for aeration or control of moisture migration. They should protect against weather, rodents, insects and thieves and must have provision for inspection.

Foundations under bins should have at least 1 square foot of bearing area for every 50 bushels of grain. Buildings should be securely anchored to the foundation or through "dead men" to the ground.

Walls must have not only necessary strength to withstand grain pressures but also must withstand these pressures without serious bulging at such points as door frames, sills or openings of joints in covering material which would permit water to enter. Wall construction should be of sheet materials or of double thickness if boards and siding are used. Provisions for ratproofing, cleaning and disinfecting should be made as described later.

Financing . . .

In general, lending agencies tend to regard storage structures as good investments. In addition to private credit sources, some government loans are available for storage construction through your county PMA committee.

Present Cribs, Bins . . .

All of the requirements mentioned above on new construction are applicable to putting existing storage structures into proper condition to receive grain. Before filling your storage structure, check the foundation, sills, connections of studding to sills, bracing and roofing to make sure all are in top condition.

Grain stored for more than 1 year places unusually heavy pressure loads on your building. If there are questions as to whether existing storage facilities are suitable for storing sealed or resealed grain, check with the local PMA committee. Remember, however, that you are responsible for the quality of grain which is finally delivered.

The plans previously mentioned for new building construction can be extremely useful as a guide in rebuilding or remodeling of older storage structures.

Converting Buildings . . .

All or part of some unused building can often be converted to bin storage or even to ear corn storage using fan ventilation or artificial drying. It's important, before making such conversion, to understand the basic differences in structural requirements of grain bins and cribs from other building types such as livestock shelters, machine sheds and garages. These buildings normally are built to carry only their own weight plus wind and snow loads and are not designed to carry the high lateral pressures on sidewalls which result from grain storage.

The 30 bin and crib plans available from the Midwest Plan Service include such convertible buildings as a farrowing barn, a farrowing house, a brooder house, 2-car garage, double truck garage and both round- and gable-roof type machine sheds, which have been slightly modified to permit their use as emergency grain storage structures.

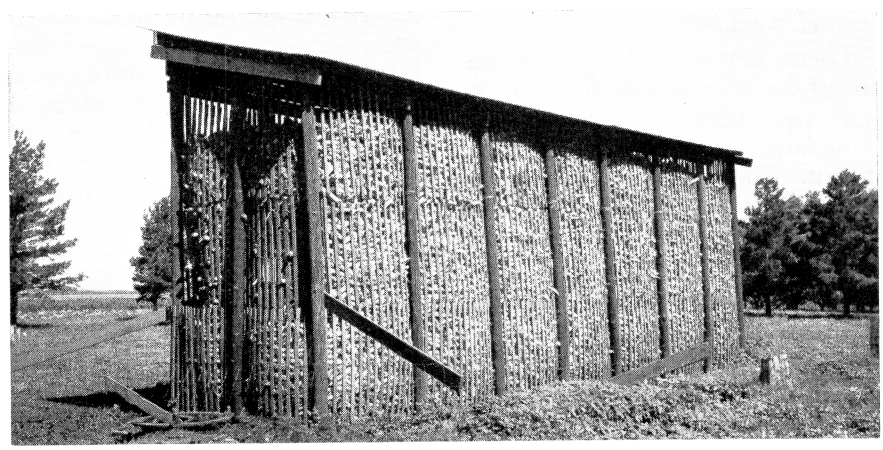
Reference to this plan material should be of help in making changes or alterations in some other types of building for use as a storage structure. If you have future need for one of the building types just mentioned and current need for additional storage facilities, one of these units might be the answer to your problem.

Silos: New silos in top condition and designed and reinforced for grass ensilage have the necessary structural strength to hold shelled corn. Older silos designed and reinforced only for corn ensilage do not have strength for storage of corn to full depth and should be used only after thorough engineering inspection. Corn should be put into silos with an elevator; blowing in with an ensilage blower results in excessive cracking of shelled corn.

Building Preparation for Resealing Corn . . .

If corn is to be stored a second year as ear corn, it probably will not be moved from the crib where it was put last fall. If it is to be shelled and stored in a tight bin, there are a few things to keep in mind in preparing the bin:

- Check the roof and sidewalls for possible leaks. Even a small opening that permits rain or snow to blow or drain into the bin may cause serious damage.
- See that the construction does not permit water to enter at the



Plans for both temporary and permanent corn storage facilities as well as for conversion of other types of buildings for emergency storage may be ordered from the Midwest Plan Service at Iowa State College.

floor or bottom of the wall. One common weakness is for one sidewall to rest on the floor slab in such a way that rain or melting snow can enter the bin by draining inward under the bottom of the wall.

- Inspect and fumigate periodically during storage to check damage from rodents, insects and birds. These pests lessen the amount and lower the quality of grain, and thus money is lost. Most of this trouble can be avoided by pre-storage precautions and periodic inspection and fumigation.
- Clean up farm yard. Remove weeds, cob piles, junk, old lumber and other hiding places for rodents.
- Kill the rodents now living on the farm. Expose dry Warfarin cereal bait in 10 to 15 bait stations. Keep these stations filled with fresh, dry bait until there is no more evidence of rats or mice. Then reduce the number of stations to one per building. Service every 10 to 14 days with fresh bait.
- Ratproof cribs and grain bins. Use ¼-inch mesh hardware cloth, smooth metal and concrete to repair or rebuild these structures.
- Empty out bins where new grain will be stored, sweep down all surfaces, remove and destroy all sweepings. Repair roofs, floors and walls.
- Spray all surfaces of bins that have held grain before with DDT or methoxychlor. Apply 1 gallon of 5 percent spray or 2 gallons of 2½ percent spray per 1,000 square feet. Let this treatment dry for several days.

Clean, dry shelled corn can be stored for long periods if it is kept free from rodents and insects and if moisture isn't permitted to increase. Condition at the time of storage is more important if storage is to be for a year or more than when grain is to be held only through the winter months. Corn condition can be controlled by precautions during shelling and bin filling:

- Do not reseal or attempt to store as shelled corn, any ear corn that has serious mold or kernel damage.
- Put in the bin only corn that has a moisture content of not over 13 percent. Even one load or a small amount of moist corn in some part of the bin will cause trouble. The best way to control this is to shell after a period of dry weather. Do not store corn that is shelled during or just after rainy or wet weather.
- Check the moisture content by withdrawing a few samples and getting measurements. Most PMA county offices can run moisture samples, or your local grain elevator may have moisture measuring equipment.
- Screen and blow out foreign material as the corn is shelled or is put in the bin. It is particularly important to exclude fine material such as grain dust and chaff.
- During loading, spray the corn stream falling into the bin, or move it from time to time. There will be a certain amount of fine material that cannot be removed and this should not be concentrated in one area in the bin.
- Operate the elevating and other equipment so that it does not crack or damage the kernels during handling. Blowers which have the corn pass directly through the fan are not recommended . . . they crack and damage the corn.
- Leave the top surface of the grain level when the bin is filled. High spots on the grain surface will tend to become moist. Leave enough space overhead to permit inspection of all parts of the surface grain.

Corn put in storage in the fall does not cool quickly. The warm corn in the middle of the bin will transfer some of its moisture to the colder corn at the upper surface. This takes place during cool or cold weather and may result in some caking or spoilage in the upper layers. In small bins this effect is less noticeable, but in larger bins it may become serious. Most farm bins are relatively small. But if shelled corn is stored in bins of 2,000 bushels or more capacity, this problem needs special attention. In such large bins, this migration of moisture can be controlled by drawing air down through the corn by mechanical ventilation.

The air must be drawn down *through* the corn—not just over the surface. Use a fan that will draw not less than .025 cubic feet per minute for each bushel. Operate it long enough to cool the center grain to near atmospheric temperature.

Storage Management . . .

Two weeks after the corn is put in storage, check it for heating, crusting or molding. Then check it at least once a month after that. Crawl over the surface, look for insects in hot areas. If grain insects are found, fumigate with carbon tetrachloride or carbon tetrachloride-carbon disulfide mixture at 3 to 4 gallons per 1,000 bushels. Follow the manufacturer's directions, wear a gas mask equipped with a fresh black canister labelled "For Organic Vapors."

Spray or sprinkle fumigant on a level, raked surface of the grain. The liquid evaporates and the vapors sink down through the grain. Fumigation can be successful regardless of outside temperature if the grain temperature is above 60° F. In hot or windy weather, cover the grain with a canvas to prevent undue loss of fumigant.

If a slight caking of any surface area occurs, rake the top layer of grain to break it up—leaving the surface level and with no hard spots.

Corn shelled at harvest time can be stored if it is dry. It is very seldom that it will dry to 13 percent moisture content in the field. But an increasing number of farmers are drying corn mechanically. New-crop shelled corn, dried naturally or mechanically so the moisture content is not above 12 percent, can be stored successfully in the same way as year-old corn. Artificially dried new corn should have a little lower moisture content than old corn when it goes into the bin . . . "moisture equalization" will push moisture content back to around 13 percent. If drying this year's crop will permit utilizing your buildings to better advantage, see your local PMA committee about loans on new-crop shelled corn.

Remember to put only dry corn in the bin with a minimum of fine foreign material, keep it dry and exclude rodents.